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ABSTRACT

The developing relation between children's knowledge about the goals and processes of reading, their skills to apply metacognitive strategies, and reading comprehension was examined. Participants were children in third-, fifth-, and eighth-grades in two primary schools in Rijeka, Croatia. All students were Croatian-speaking. A questionnaire of metacognitive reading knowledge and measures of comprehension monitoring during reading were applied in addition to measures of reading fluency and comprehension. Students in the eighth grade manifested better metacognitive knowledge of reading than students in the third and the fifth grades. Multiple regression showed that metacognitive self-monitoring during reading was significant predictor of reading comprehension at all three developmental levels. Besides reading fluency, which explained about 17% of variance, the only significant metacognitive predictor in third-grade students was cloze task, which explained additional 17% of variance, indicating that comprehension monitoring is possible only on the local processing level of reading. In the fifth- and eighth-grade students, self-monitoring played a more important role in reading comprehension than in the third grade. The cloze task and error detection task explained more than 25% of variance of reading comprehension. (Contains 20 references, and 2 tables and a figure of data.) (Author/RS)

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Children's metacognition as predictor of reading comprehension at different developmental levels

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Abstract

The developing relation between children's knowledge about the goals and processes of reading, their skills to apply metacognitive strategies, and reading comprehension was examined. Participants were children in third-, fifth-, and eighth-grades. A questionnaire of metacognitive reading knowledge, and measures of comprehension monitoring during reading were applied in addition to measures of reading fluency and comprehension. Students in the eighth grade manifested better metacognitive knowledge of reading than students in the third and the fifth grades. Multiple regression showed that metacognitive self-monitoring during reading was significant predictor of reading comprehension at all three developmental levels. Besides reading fluency, which explained about 17% of variance, the only significant metacognitive predictor in third-grade students was close task, which explained additional 17 % of variance, indicating that comprehension monitoring is possible only on the local processing level of reading. In the fifth- and eight-grade students, self-monitoring played a more important role in reading comprehension than in the third-grade. The close task and error detection task explained more than 25 % of variance of reading comprehension.

Introduction

Reading can be regarded as a multidimensional activity including letter and word recognition, sentence processing and constructing meaning, but it also requires ongoing monitoring of comprehension and regulation of reading according to the goals of reading. Monitoring and regulation of reading are usually considered fundamental components of metacognition, besides metacognitive knowledge, which includes knowledge about one's self thinking, about different types of tasks and about reading strategies (Flavell, 1979; Baker and Brown, 1984; Paris et al. 1984).

Lomax and McGee (1987) identified five components related to early reading: concepts about print, graphic awareness, phonological awareness, grapheme-phoneme correspondence knowledge, and word reading. Children's performance increased with age on each of the tasks. Acquisition of concepts about literacy and pre-reading skills emerges by age 4 with progressive improvement later. Children's initial knowledge about the nature of reading was extensively researched. Hiebert (1981) found that 3-year-olds know something about sound/symbol correspondence and letter naming, but their awareness improves sharply between the ages of 3 and 4. Phonological awareness develops before entering school and showed as important predictor of later reading ability (Bradley and Bryant, 1983; Lundberg, Foost and Peterson, 1988).

Knowledge about reading continues to develop beyond the age 7. Johns and Ellis (1976) found that only 15 percent of the elementary school students defined reading as constructing meaning and most of those responses were from students in grades 7 and 8. Only 20 percent of students indicated that they tried to create meaning as they read and most of these responses also came from students in higher grades. More than 50 percent of the students emphasised word recognition as fundamental skill for reading.

Myers and Paris (1978) examined metacognitive knowledge of children between 8- and 12-year-olds and also found that older children knew more about text structure, various goals and reading strategies than younger children. Older children know more about using strategies to construct meaning and to resolve comprehension failures as well.

Knowledge about reading strategies is not sufficient guarantee that readers will read strategically. Reading strategies are cognitive tools that can be used selectively and flexibly. Strategic reading reflects metacognition and motivation because readers need to know the strategies and to have disposition to use them. Metacognition and strategic reading is manifested in various procedures that readers use to monitor comprehension. Baker and Brown (1984) argued that any attempt to comprehend must involve comprehension monitoring. Wagoner (1983) describes comprehension monitoring as "an executive function, essential for competent reading, which directs the readers' cognitive process as he/she strives to make sense of the incoming information" (p.328). Differences in the comprehension monitoring were consistently found between good and poor readers (Paris and Myers, 1981; Garner and Kraus, 1982; Grabe and Mann, 1984). Poor readers had difficulties identifying inconsistencies in the text.

There are also developmental differences in comprehension monitoring. Garner and Tylor (1982) asked second, fourth and sixth graders to find semantic inconsistencies in passages. Younger children did not find the errors in the passages spontaneously, and even older children had difficulty finding all inconsistencies. Baker (1984) obtained similar results with 9- and 11-year-olds. Nine-year-olds had difficulty detecting contradictions in story content.

Paris, Wasik and Turner (1991) summarised factors that contribute to the effects of age on comprehension monitoring. First, young children may not believe that there are mistakes in text. Second, attention capacity is engaged primarily in word understanding, and there are not enough cognitive resources left to construct meaning and monitor comprehension. Third, many young readers do not understand the standards that can be used to evaluate comprehension. Fourth, reporting comprehension failure is substituted by making inferences in order to construct sensible text interpretation.

Pazzaglia, Beni and Caccio (1999) investigated the relationship between both aspects of metacognition and reading comprehension in a sample of children from eight to 13 years. They have found a strong differentiation between declarative/procedural knowledge about text and strategies and on-line aspects of metacognition – comprehension monitoring and judgement on text parts importance. On-line aspects of metacognition showed a continuous positive developmental trend, even in secondary school and later. Both knowledge about goals and that about strategies showed a different developmental trend, with striking improvements for the former between eight to nine years, and eleven to twelve years, and for the latter between eight to nine years, nine to ten, and eleven to twelve years.

The first aim of this study was to explore developmental differences in metacognitive knowledge of elementary school students from third to eighth grade. Measure of metacognitive knowledge includes examination of reading awareness and knowledge about strategies. The second aim was to explore effects of both, metacognitive knowledge and comprehension monitoring as on-line aspects of metacognition, besides reading fluency as predictors of reading comprehension on different developmental levels.

Method

Participants

The participants in the study were 93 third-graders (47 girls and 46 boys) from five classes, 105 fifth-graders (58 girls and 47 boys) from five classes, and 83 eighth-graders (44 girls and 39 boys) from four classes. The study was conducted in two primary schools in Rijeka, Croatia. All students were Croatian-speaking.

Materials

Reading fluency and reading comprehension. Assessment was made on three different stories, one story for each grade. The stories were chosen according to the curriculum for each grade. The story for third grade had 750 words, for fifth grade 1310 words and for eighth grade 1520 words. Measure of reading fluency was computed as number of words read in one minute. Stories were followed by 15 questions. Measure of reading comprehension was the number of correct responses. Answers that were completely appropriate were awarded with two points. Partially correct answers were awarded with one point.

Metacognitive knowledge. A Croatian adaptation of the questionnaire constructed by Paris, Cross and Lipson (1984) was used for assessment of metacognitive knowledge about reading. The questions were about text structure, various goals of reading and reading strategies. The original 20-item questionnaire was shortened to 15 multiple-choice questions. Internal consistency of the Croatian adaptation of the questionnaire was α = .60; α=.78; α=.58, respectively.

Comprehension monitoring. Close-task and sentence detection task were used as measures of comprehension monitoring. Three different forms of close task were constructed, one for each grade. The passages used to construct the different versions

were taken from readers for the corresponding grade level. In passages for third and fifth grade 13 words were missing, and for eighth grade 16 words. This created 13 or 16 blank spaces that children were required to fill in with single words. Children's close responses were scored according to the following procedure: (a) Responses that were both semantically and syntactically appropriate to the missing word were awarded 2 points; (b) responses that were either semantically or syntactically appropriate, but not both, were awarded one point; (c) blanks and responses that were neither semantically nor syntactically appropriate were not awarded any point.

In sentence detection task children read a story consisting of six passages. Each passage contained a sentence that was semantically inappropriate to the passage. Children were asked to underline the inappropriate sentence. Wrong detection was penalized by subtracting it from the number of errors detected correctly.

Procedure

All tasks were administered to children in their classrooms as intact groups during two school hours. The tasks were not time constrained.

Results

Differences in metacognitive knowledge between students in third, fifth and eighth grade were tested by one-way ANOVA, which showed a significant effect of grade ($F(2, 278) = 12.95$ $p < .001$) (Figure 1). Post-hoc comparison by Newman-Keuls test showed that eighth-grade students have a better metacognitive knowledge of reading than the third- and fifth-grade students.

Correlation between measures of metacognitive knowledge and measures of comprehension monitoring were computed for each grade. Significant correlations in third graders were found only between metacognitive knowledge and sentence detection task ($r = .58$), and in fifth and eight graders for both monitoring tasks. The

correlation between metacognitive knowledge and close task was .53 for fifth-graders, and .35 for eighth graders, and between metacognitive knowledge and sentence detection task .35, and .22, respectively. Reading fluency was related to metacognitive knowledge (r = .35) and sentence detection task (r = .26) only in third graders.

Correlation of reading comprehension with reading fluency and metacognitive variables were also computed for each grade independently (Table 1). Reading fluency was significantly related with reading comprehension only for the third graders. Looking at measures of reading comprehension and metacognition, there are moderately strong relations among all measures. Comprehension monitoring, especially performance on the close task, was stronger related to reading comprehension than metacognitive knowledge.

Multiple regression analysis was performed for reading comprehension as the dependent variable, and reading fluency, metacognitive knowledge and comprehension monitoring as the predictor variables for each grade. Multiple correlation for the third grade was R = .61, for the fifth grade R = .63, and for the eighth grade F = .56 (Table 2). Significant unique contributors for the third grade were reading fluency (9.6 %) and close task (11.56 %), but for the fifth and eighth grades both comprehension monitoring tasks. Significant contributions of close task was 6.8 % in the fifth and 12.25 % in the eighth grade, and contributions of sentence detection task was 10.2 % in the fifth and 4.8 % in the eighth grade.

Discussion

Students in the eighth grade manifested better metacognitive knowledge of reading than students in the third and the fifth grades. Our results are similar to the results of Pazzaglia et al. (1999). Metacognitive knowledge showed improvement between fifth and eighth grades (eleven and fourteen years old students). Seemingly,

both development and reading experience contribute to metacognitive knowledge about reading. Knowledge about reading strategies is part of growing knowledge about reading. Preschoolers' emergent knowledge about literacy reflects incomplete concepts about the nature of reading, print conventions and processes, and purposes of reading. During elementary school, these concepts become more refined, but even older elementary school students do not have well-articulated concepts about reading nor fully developed knowledge about effective strategies to enhence comprehension. Children's knowledge about reading develops concurrently with their understanding and control of strategies, and these factors become congruent with increasing age and skill (Cross and Paris, 1988).

Metacognitive knowledge is related to comprehension monitoring, but moderate correlations showed that this knowledge is not sufficient guarantee that children will apply strategies. The relatively high correlation between metacognitive knowledge and sentence detection task in third grade students is somewhat surprising. This result could be explained by a significant correlation between reading fluency and sentence detection task indicating that more fluent reading allows checking units greater than word level. Students are more likely to develop metacognitive knowledge and apply strategies when a lower level cognitive skill (word encoding) has become automated. In fifth and eight grades almost all students read more than 100 words per minute and fluency does not make any difference in sentence level processing. These results support Pazzaglia et al.'s (1999) multicomponential model of metacognition that differentiates between metacognitive knowledge and on-line aspects of metacognition. Local comprehension monitoring is more related to metacognitive knowledge than sentence detection. It is possible that higher level text processing has started to play a more important role in fifth grade than before.

Reading fluency is significantly related to reading comprehension only in third grade. Interindividual variability in reading fluency in third grade is large enough to produce a significant correlation. The speed at which words are recognized is still a critical factor in ensuring that children understand what they read. Automaticity in word recognition contributes to fluency. Fluency is important because it enables readers to spend their cognitive resources on understanding the text rather than on attempting to encode individual words. If students read the words in an inefficient manner, they cannot remember what they read and relate the ideas to their background knowledge, because of working memory capacity limitations. In fifth and eighth grade almost all students read fast enough and there is no significant effect of fluency on reading comprehension. In fifth grade, comprehension monitoring becomes more important than reading fluency.

Results of regression analysis also support the hypothesis that metacognitive variables, especially comprehension monitoring are considerably involved in reading comprehension (Paris and Myers, 1981; Vasniadou, Pearson and Rogers, 1988; Pazzaglia et al., 1999). Monitoring meaning in third grade students was not so important for text comprehension as in older students because their attention is directed at decoding and analyzing words' meaning. In fifth and eighth grade comprehension monitoring became a better predictor of reading comprehension than fluency. Comprehension monitoring in third graders is executed not only on word level, but also on sentence level, as can be seen from the significant contribution of sentence detection task to reading comprehension.

Metacognitive knowledge is not a significant independent predictor of reading comprehension, because its effect is mediated by on-line metacognition. Active usage of metacognitive strategies is more important for reading comprehension than merely

passive knowledge about strategies. Strategic reading reflects interactive effect of sufficient metacognitive knowledge, sufficient practice, adequate instruction about strategies and motivational factors. There are different reasons why children don't use strategies efficiently. Children often believe that the strategies will not make a difference in their reading because they perceive the reading task as too difficult and out of their control. Proper instruction about reading strategies, ways and conditions of their usage (Palincsar and Brown, 1984; Cross and Paris, 1988) could stimulate students for strategy usage and improve reading comprehension.

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Author Note

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Figure 1. Metacognitive knowledge in third, fifth and eighth graders

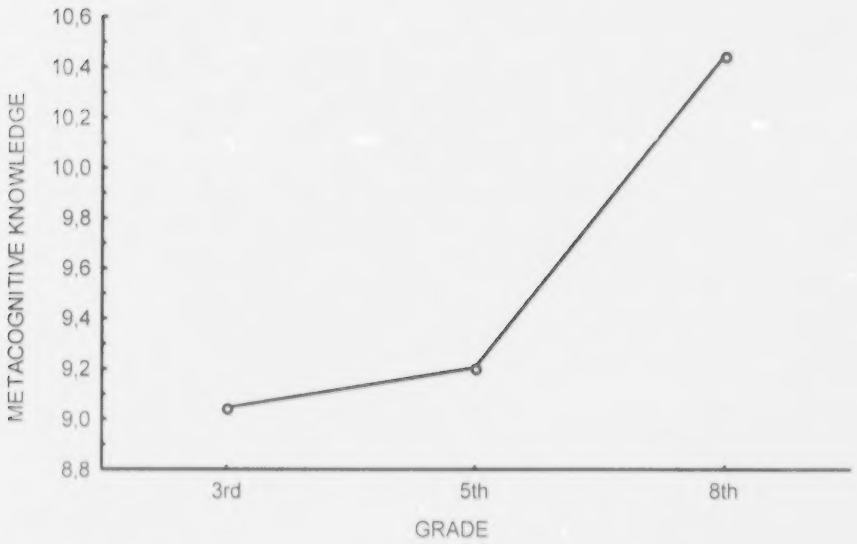

Table 1.

Correlation between reading comprehension, reading fluency, metacognitive knowledge and comprehension monitoring

	Reading comprehension		
	3rd grade	5th grade	8th grade
Reading fluency	.45**	.00	.05
Metacognitive knowledge	.36**	.32**	.33**
Close task	.51**	.54**	.49**
Sentence detection	.38**	.56**	.36**

**p < .001

Table 2.

Results of regression analysis of reading fluency, metacognitive knowledge and comprehension monitoring tasks as predictors of reading comprehension

Grade	Predictors	B	β	semipar. corr.	t
Third	Fluency	.06	.34	.31	3.87**
	Metacognitive knowledge	.29	.10	.08	1.02
	Close task	.58	.37	.34	4.23**
	Sentence detection	.26	.10	.08	.97
		R=.66	R^2=.43	F(5, 87)=13.39	p<.001
Fifth	Metacognitive knowledge	.05	.02	.02	.24
	Close task	.35	.34	.26	3.39**
	Sentence detection	.94	.38	.32	4.19**
		R=.64	R^2=.41	F(5, 99)=13.55	p<.001
Eighth	Metacognitive knowledge	.71	.15	.14	1.51
	Close task	.45	.39	.35	3.73**
	Sentence detection	.88	.24	.22	2.38*
		R=.57	R^2=.33	F(5, 77)=7.43	p<.001

*p<.05

**p<.001